

Twin Cities Army Ammunition Plant  
New Brighton  
Ramsey County  
Minnesota

HAER No. MN-4

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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record  
National Park Service  
Department of the Interior  
Washington, DC 20013-7127

HISTORIC AMERICAN ENGINEERING RECORD

Twin Cities Army Ammunition Plant

MN-4

Location: In Ramsey County, Minnesota, approximately ten miles north of Minneapolis and St. Paul. Bounded on the east by Lexington Avenue, on the south by Trunk Highway No. 96, and on the west by County Road H.

Date of Construction: Established in 1941.

Owner: Department of the Army

Significance: Twin Cities Army Ammunition Plant was one of several ammunition plants established at the onset of World War II. The plant manufactured .30-caliber and .50-caliber ammunition, and the last year of the war it had been expanded to include the production of metal parts of 105-mm and 155-mm artillery shells.

Historical Report  
Prepared by: Jeffrey A. Hess, 1984.

Prepared for  
Transmittal by: Robie S. Lange, HABS/HAER, 1985.

## EXECUTIVE SUMMARY

The Twin Cities Army Ammunition Plant is a government-owned, contractor-operated manufacturing facility for small arms ammunition and metal components for artillery shells. The installation is part of the Army's Armament, Munitions and Chemical Command (AMCCOM). It is located on a 2,400 acre site in New Brighton, Minnesota, approximately ten miles north of the Twin Cities of Minneapolis and St. Paul. Most of the existing 262 buildings were constructed during World War II, with the majority dating from 1941-1942. Upon cessation of hostilities, the plant was designated as a salvage center for small arms ammunition, and most of its production lines were laid away intact. Additional construction occurred when the facility was reactivated for production runs during the Korean and Vietnam Wars. During these periods of reactivation several alterations were made to the plant's production lines: some were eliminated, others simplified, and most retooled for new ammunition sizes. Despite these changes, the surviving production machinery and techniques retain much of their original character.

Many of the buildings at the Twin Cities AAP are excellent examples of the specialized designs for small arms plants developed by the architectural firm of Smith, Hinchman, & Grylls. Others house historically significant production lines. For these reasons, Buildings 101 and 102 (7.62-mm Production), 105 (Administration), 111 (Lead Shop), 115 (Heating Plant), 135 (Primer Manufacture), 501 (155-mm Metal Parts Production), and 503 (5.56-mm Production) are Category III properties.

CONTENTS

Executive Summary

PREFACE . . . . .	1
1. INTRODUCTION . . . . .	3
Scope . . . . .	3
Methodology . . . . .	4
2. HISTORICAL OVERVIEW . . . . .	14
Background . . . . .	14
World War II . . . . .	17
Korean War . . . . .	33
Vietnam War . . . . .	36
3. PRESERVATION RECOMMENDATIONS . . . . .	43
Background . . . . .	43
Category I Historic Properties . . . . .	48
Category II Historic Properties . . . . .	49
Category III Historic Properties . . . . .	49
BIBLIOGRAPHY . . . . .	52

## PREFACE

This report presents the results of an historic properties survey of the Twin Cities Army Ammunition Plant (Twin Cities AAP). Prepared for the United States Army Materiel Development and Readiness Command (DARCOM), the report is intended to assist the Army in bringing this installation into compliance with the National Historic Preservation Act of 1966 and its amendments, and related federal laws and regulations. To this end, the report focuses on the identification, evaluation, documentation, nomination, and preservation of historic properties at the Twin Cities AAP. Chapter 1 sets forth the survey's scope and methodology; Chapter 2 presents an architectural, historical, and technological overview of the installation and its properties; and Chapter 3 identifies significant properties by Army category and sets forth preservation recommendations. Illustrations and an annotated bibliography supplement the text.

This report is part of a program initiated through a memorandum of agreement between the National Park Service, Department of the Interior, and the U.S. Department of the Army. The program covers 74 DARCOM installations and has two components: 1) a survey of historic properties (districts, buildings, structures, and objects), and 2) the development of archaeological overviews. Stanley H. Fried, Chief, Real Estate Branch of Headquarters DARCOM, directed the program for the Army, and Dr. Robert J. Kapsch, Chief of the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) directed the program for the National Park Service. Sally Kress Tompkins was program manager, and Robie S. Lange was

project manager for the historic properties survey. Technical assistance was provided by Donald C. Jackson.

Building Technology Incorporated acted as primary contractor to HABS/HAER for the historic properties survey. William A. Brenner was BTI's principal-in-charge and Dr. Larry D. Lankton was the chief technical consultant. Major subcontractors were the MacDonald and Mack Partnership and Jeffrey A. Hess. The authors of this report were Jeffrey A. Hess and Robert C. Mack. The authors gratefully acknowledge the help of Owen Mobley and Ellen Tillman of the government staff, Twin Cities AAP; Courtland Torgeson of Donovan Construction Company; and Ken Buckley of Federal Cartridge Corporation.

The complete HABS/HAER documentation for this installation will be included in the HABS/HAER collections at the Library of Congress, Prints and Photographs Division, under the designation HAER No. MN-4.

## Chapter 1

### INTRODUCTION

#### SCOPE

This report is based on an historic properties survey conducted in 1983 of all Army-owned properties located within the official boundaries of the Twin Cities Army Ammunition Plant (Twin Cities AAP). The survey included the following tasks:

- . Completion of documentary research on the history of the installation and its properties.
- . Completion of a field inventory of all properties at the installation.
- . Preparation of a combined architectural, historical, and technological overview for the installation.
- . Evaluation of historic properties and development of recommendations for preservation of these properties.

Also completed as a part of the historic properties survey of the installation, but not included in this report, are HABS/HAER Inventory cards for 28 individual properties. These cards, which constitute HABS/HAER Documentation Level IV, will be provided to the Department of the Army. Archival copies of the cards, with their accompanying photographic

negatives, will be transmitted to the HABS/HAER collections at the Library of Congress.

The methodology used to complete these tasks is described in the following section of this report.

### METHODOLOGY

#### 1. Documentary Research

The Twin Cities Army Ammunition Plant (TCAAP) was one of six government-owned, contractor-operated facilities constructed during 1940-1942 for the manufacture of military small arms ammunition.\* Since the plant was part of a larger manufacturing network, an evaluation of its historical and technological significance requires a general understanding of the wartime ammunition industry. To identify published documentary sources on American ammunition manufacturing during World War II, research was conducted in standard bibliographies of military history, engineering, and the applied sciences. Unpublished sources were identified by researching the historical and technical archives of the U.S. Army Material Readiness Command (ARRCOM) at Rock Island Arsenal.<sup>1</sup>

In addition to such industry-wide research, a concerted effort was made to locate published sources dealing specifically with the history

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\* By traditional usage, small arms ammunition includes all projectiles with a diameter measuring six-tenths of an inch (.60 caliber) or less.

and technology of the TCAAP. This site-specific research was conducted primarily at the ARRCOM Historical Office at Rock Island Arsenal, the Hennepin County Historical Society in Minneapolis, the Minneapolis Public Library (Minneapolis History Collection), the Minnesota Historical Society (Division of Archives and Manuscripts, Reference Library, State Historic Preservation Office), the Ramsey County Historical Society in St. Paul, the St. Paul Public Library, and the TCAAP (contractors' archives, government real property records office). The State Historic Preservation Officer had no specific comments on the significance of the installation.

On the basis of this literature search, a number of valuable sources were identified. These included several published studies on the construction and operation of small arms ammunition plants; a detailed, unpublished, "industrial facilities inventory" of the TCAAP prepared by the Corps of Engineers in 1944 (ARRCOM Historical Office, Rock Island Arsenal); and an extensive collection of World-War-II-vintage construction photographs, newspaper files, and contractors' reports dealing with the TCAAP (contractors' archives, TCAAP).

Army records used for the field inventory included current Real Property Inventory (RPI) printouts that listed all officially recorded buildings and structures by facility classification and date of construction; the installation's property record cards; base maps and photographs supplied by installation personnel; and installation master planning, archaeological, environmental assessment, and related

reports and documents. A complete listing of this documentary material may be found in the bibliography.

## 2. Field Inventory

Architectural and technological field surveys were conducted in January 1983 by Stuart MacDonald, Robert Mack, and Jeffrey Hess. Following general discussions with Owen Mobley, the Commander's representative for TCAAP, the surveyors were permitted access to all exterior areas without escorts. Ellen Tillman, Real Property Officer, made arrangements for entry to production areas and served as escort during these visits. Courtland Torgeson of Donovan Construction Company served as a guide in the 155-mm metal parts areas and explained both current and past methods of production. Ken Buckley of Federal Cartridge Corporation served the same role for tours in the small arms ammunition manufacturing areas.

Field inventory procedures were based on the HABS/HAER Guidelines for Inventories of Historic Buildings and Engineering and Industrial Structures.<sup>2</sup> All areas and properties were visually surveyed. Building locations and approximate dates of construction were noted from the installation's property records and field-verified. Interior surveys were made of the major facilities to permit adequate evaluation of architectural features, building technology, and production equipment.

Field inventory forms were prepared for, and black and white 35 mm photographs taken of all buildings and structures through 1945 except basic utilitarian structures of no architectural, historical, or technological interest. When groups of similar ("prototypical") buildings were found, one field form was normally prepared to represent all buildings of that type. Field inventory forms were also completed for representative post-1945 buildings and structures.<sup>3</sup> Information collected on the field forms was later evaluated, condensed, and transferred to HABS/HAER Inventory cards.

### 3. Historical Overview

A combined architectural, historical, and technological overview was prepared from information developed from the documentary research and the field inventory. It was written in two parts: 1) an introductory description of the installation, and 2) a history of the installation by periods of development, beginning with pre-military land uses. Maps and photographs were selected to supplement the text as appropriate.

The objectives of the overview were to 1) establish the periods of major construction at the installation, 2) identify important events and individuals associated with specific historic properties, 3) describe patterns and locations of historic property types, and 4) analyze specific building and industrial technologies employed at the installation.

4. Property Evaluation and Preservation Measures

Based on information developed in the historical overviews, properties were first evaluated for historical significance in accordance with the eligibility criteria for nomination to the National Register of Historic Places. These criteria require that eligible properties possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that they meet one or more of the following:<sup>4</sup>

- A. Are associated with events that have made a significant contribution to the broad patterns of our history.
- B. Are associated with the lives of persons significant in the nation's past.
- C. Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction.
- D. Have yielded, or may be likely to yield, information important in pre-history or history.

Regulation 420-40:<sup>5</sup>

- Category V Properties detrimental to the significance  
of adjacent historic properties.

Based on an extensive review of the architectural, historical, and technological resources identified on DARCOM installations nationwide, four criteria were developed to help determine the appropriate categorization level for each Army property. These criteria were used to assess the importance not only of properties of traditional historical interest, but also of the vast number of standardized or prototypical buildings, structures and production processes that were built and put into service during World War II, as well as of properties associated with many post-war technological achievements. The four criteria were often used in combination and are as follows:

- 1) Degree of importance as a work of architectural, engineering, or industrial design. This criterion took into account the qualitative factors by which design is normally judged: artistic merit, workmanship, appropriate use of materials, and functionality.

- 2) Degree of rarity as a remaining example of a once widely used architectural, engineering, or industrial design or process.

This criterion was applied primarily to the many standardized or prototypical DARCOM buildings, structures, or industrial processes. The more widespread or influential the design or process, the greater the importance of the remaining examples of the design or process was considered to be. This criterion was also used for non-military structures such as farmhouses and other once prevalent building types.

- 3) Degree of integrity or completeness. This criterion compared the current condition, appearance, and function of a building, structure, architectural assemblage, or industrial process to its original or most historically important condition, appearance, and function. Those properties that were highly intact were generally considered of greater importance than those that were not.

- 4) Degree of association with an important person, program, or event. This criterion was used to examine the relationship of a property to a famous personage, wartime project, or similar factor that lent the property special importance.

The majority of DARCOM properties were built just prior to or during World War II, and special attention was given to their evaluation. Those that still remain do not often possess individual importance,

but collectively they represent the remnants of a vast construction undertaking whose architectural, historical, and technological importance needed to be assessed before their numbers diminished further. This assessment centered on an extensive review of the military construction of the 1940-1945 period, and its contribution to the history of World War II and the post-war Army landscape.

Because technology has advanced so rapidly since the war, post-World War II properties were also given attention. These properties were evaluated in terms of the nation's more recent accomplishments in weaponry, rocketry, electronics, and related technological and scientific endeavors. Thus the traditional definition of "historic" as a property 50 or more years old was not germane in the assessment of either World War II or post-war DARCOM buildings and structures; rather, the historic importance of all properties was evaluated as completely as possible regardless of age.

Property designations by category are expected to be useful for approximately ten years, after which all categorizations should be reviewed and updated.

Following this categorization procedure, Category I, II, and III historic properties were analyzed in terms of:

- Current structural condition and state of repair. This information was taken from the field inventory forms and

photographs, and was often supplemented by rechecking with facilities engineering personnel.

- The nature of possible future adverse impacts to the property. This information was gathered from the installation's master planning documents and rechecked with facilities engineering personnel.

Based on the above considerations, the general preservation recommendations presented in Chapter 3 for Category I, II, and III historic properties were developed. Special preservation recommendations were created for individual properties as circumstances required.

#### 5. Report Review

Prior to being completed in final form, this report was subjected to an in-house review by Building Technology Incorporated. It was then sent in draft to the subject installation for comment and clearance and, with its associated historical materials, to HABS/HAER staff for technical review. When the installation cleared the report, additional draft copies were sent to DARCOM, the appropriate State Historic Preservation Officer, and, when requested, to the archaeological contractor performing parallel work at the installation. The report was revised based on all comments collected, then published in final form.

NOTES

1. The following bibliographies of published sources were consulted: Industrial Arts Index, 1938-1957; Applied Science and Technology Index, 1958-1980; Engineering Index, 1938-1983; Robin Higham, ed., A Guide to the Sources of United States Military History (Hamden, Conn.: Archon Books, 1975); John E. Jessup and Robert W. Coakley, A Guide to the Study and Use of Military History (Washington, D.C.: U.S. Government Printing Office, 1979); "Military Installations," Public Works History in the United States, eds., Suellen M. Hoy and Michael C. Robinson (Nashville: American Association for State and Local History, 1982), pp. 380-400. AMCCOM (formerly ARRCOM, or U.S. Army Materiel Readiness Command) is the military agency responsible for supervising the operation of government-owned munitions plants; its headquarters are located at Rock Island Arsenal, Rock Island, Illinois. Although there is no comprehensive index to AMCCOM archival holdings, the agency's microfiche collection of unpublished reports is itemized in ARRCOM, Catalog of Common Sources, Fiscal Year 1983, 2 vols. (no pl.: Historical Office, ARRCOM, Rock Island Arsenal, n.d.).
2. Historic American Buildings Survey/Historic American Engineering Record, National Park Service, Guidelines for Inventories of Historic Buildings and Engineering and Industrial Structures (unpublished draft, 1982).
3. Representative post-World War II buildings and structures were defined as properties that were: (a) "representative" by virtue of construction type, architectural type, function, or a combination of these, (b) of obvious Category I, II, or III historic importance, or (c) prominent on the installation by virtue of size, location, or other distinctive feature.
4. National Park Service, How to Complete National Register Forms (Washington, D.C.: U.S. Government Printing Office, January 1977).
5. Army Regulation 420-40, Historic Preservation (Headquarters, U.S. Army: Washington, D.C., 15 April 1984).

## Chapter 2

### HISTORICAL OVERVIEW

#### BACKGROUND

The TCAAP is a government-owned, contractor-operated installation situated on a 2,400-acre site approximately ten miles north of the Twin Cities of Minneapolis and St. Paul. Constructed in 1941-1942 for the manufacture of .30-caliber and .50-caliber ammunition, the plant expanded its operations in 1944 to include the production of metal parts of 105-mm and 155-mm artillery shells. Immediately following V-J Day, the TCAAP suspended its manufacturing activities and assumed the status of a "standby" plant with most of its production lines intact. During the late 1940s and early 1950s, the plant housed a bullet-reclamation center that made significant contributions to ammunition salvage technology. When the TCAAP was reactivated for major production runs during the Korean War, it experienced both new construction and technological renovation — a process that was to be repeated during the Vietnam War.

At present, the TCAAP comprises 262 buildings, the vast majority of which date from the original construction period (Figures 1, 2,). Although most of the World-War-II-era buildings remain, the plant's original production machinery has been substantially reduced. All of the .50-caliber and 105-mm lines have been dismantled, and most of their constituent machinery removed from the site. The surviving production lines, however, still retain much of their World-War-II character. The existing .30-caliber lines have been retooled for the manufacture of 5.56-mm and 7.62-mm



Figure 1: Map of Twin Cities AAP in 1974, most recent map available. (Source: Facilities Engineering Office, Twin Cities AAP.).

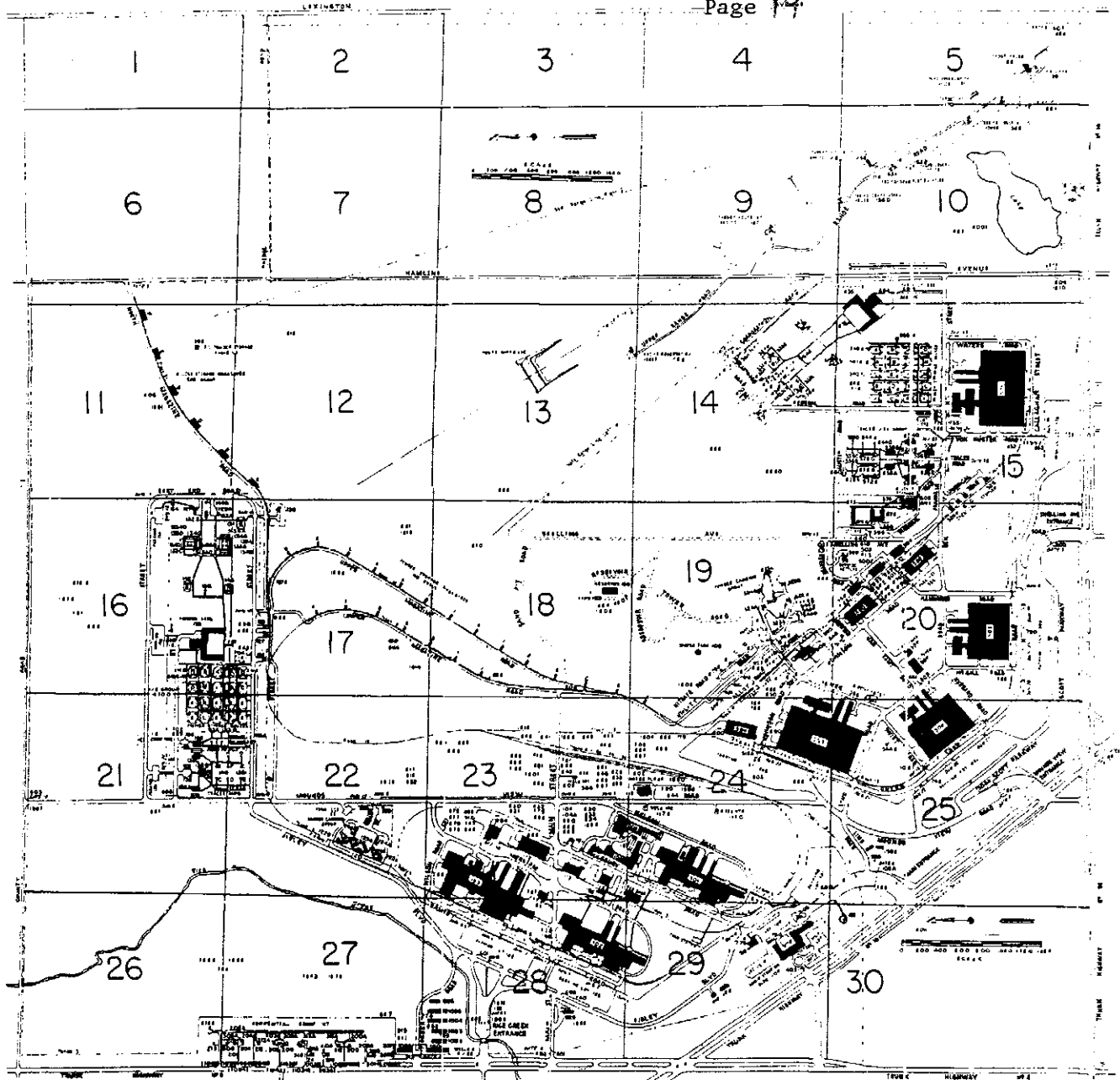


Figure 2: Map of Twin Cities AAP in 1945. (Source: Assembled from four maps in "Industrial Facilities Inventory of the Twin Cities Ordnance Plant." AMCCOM Historical Office Archives, Rock Island Arsenal.)

ammunition, but these modifications have not significantly altered the original production techniques. And the production lines for 155-mm shell parts survive with most of their original equipment intact. Although all of the government-owned production lines at the site are currently inactive, several buildings are now tenanted by private firms engaged in defense-related research and manufacturing.

For a more detailed understanding of the plant's architectural and technological history, it is necessary to look more closely at the site's three major production periods: World War II, the Korean War, and the Vietnam War. Whenever the available data permits, the discussion will focus on specific buildings and processes.

## WORLD WAR II

When war broke out in Europe in the fall of 1939, the United States had virtually no industrial capability for manufacturing military small arms ammunition. During the 1930s, the only American plant producing such items was the government-owned and -operated Frankford Arsenal in Philadelphia. Frankford's manufacturing capacity, however, was very limited, and by state-of-the-art standards, its production lines were antiquated. In 1938-1939, the government took the first steps toward remedying these deficiencies by allocating funds for the modernization of the arsenal's production machinery. At the same time, the arsenal's personnel were instructed to draw up "plans for speeding production in the event of war, including model plant layouts, descriptions of manufacture, estimates of personnel needs, lists of tools and machinery requirements, and data on

commercial sources of raw materials."<sup>1</sup> These production plans laid the groundwork for the construction of six government-owned, contractor-operated, small arms ammunition plants that were built in two "waves" of three plants each during 1940-1942. The second wave of construction included the TCAAP.<sup>2</sup>

#### Site Selection and Former Land Use

The selection of the TCAAP site was governed by the same basic criteria used in evaluating locations for all first- and second-wave plants. These considerations included:

- (1) availability of suitable labor without major housing projects
- (2) proximity to a main railroad line
- (3) availability of adequate electric power
- (4) availability of natural or artificial gas for processing purposes
- (5) ample supply of water for processing purposes
- (6) mid-continental location as a defense against enemy bombardment.<sup>3</sup>

The TCAAP site satisfied all criteria. The Twin Cities housed a sizeable industrial work force, and were a major distribution center for rail freight, electric power, and natural gas. The area's geology assured an abundance of easily accessible well water. The selection of the TCAAP site also seems to have been influenced by the fact that its location was only about ten miles from the Federal Cartridge Company of Anoka, one of the

nation's few commercial manufacturers of small arms ammunitions. On July 14, 1941, Federal Cartridge Company signed a cost-plus-fixed-fee contract with the government and assumed responsibility for operating the proposed plant.<sup>4</sup>

Until the government's acquisition of the site, the land had been used almost exclusively for agricultural purposes. When the government formally took possession on August 4, 1941, the boundaries of the new plant enclosed approximately 125 structures, several farmsteads, a small sand-and-gravel operation, a tree nursery, and a wild-life preserve. Except for a few houses that were retained for quartering plant personnel, all of the pre-1941 structures were eventually removed from the site.<sup>5</sup>

### Construction

Construction work at the TCAAP\* commenced on August 28, 1941, under the supervision of Colonel Joe S. Underwood, Quartermaster Corps. In mid-November, Underwood moved on to another project, and his position was taken by Captain Lynn C. Barnes, who had served as Constructing Quartermaster for a first-wave plant at Lake City, Missouri.<sup>6</sup> Barnes was on familiar ground, for the Lake City installation had been designed as a prototype for future small arms manufacturing facilities, including the TCAAP. The design contracts for these projects had been awarded to Smith, Hinchman, & Grylls, Inc. of Detroit, one of the country's oldest and

\* Throughout the World-War-II era, the TCAAP was officially designated as the Twin Cities Ordnance Plant, and after the war, it was named the Twin Cities Arsenal. The plant's current name, which dates from 1963, is used throughout this report for the sake of brevity and clarity.

largest architectural and engineering companies. Using model machinery layouts prepared at Frankford Arsenal during the late 1930s, Smith, Hinchman, & Grylls, attempted to create a set of standard plans that could be adapted for all six small arms ammunition plants. Variations within this standard pattern resulted primarily from differences in topography at the various sites and from the special requirements of the individual operating companies. As a spokesman for Smith, Hinchman, & Grylls was careful to point out, "Design variations were never introduced by the architects for the sake of variety: considerations of speed and economy made imperative exactly the reverse. Whenever it was possible to repeat a detail of one plant in another, or even entire buildings, it was done."<sup>7</sup>

According to the Smith, Hinchman & Grylls design, architectural form primarily reflected industrial function. For example, the long, horizontal, two-story configuration of the ammunition manufacturing buildings was dictated by the extended, linear arrangement of the production lines on the first floor, which were hopper-fed by conveyor lines on the second floor. To determine the proper shape and dimensions of these buildings, the architects literally planned the structures from the inside-out:

A carefully prepared template for each machine is cut out of cardboard and these are then assembled into plans of departments. The machine templates are in color, so that each type may be identified instantly, and colored strips are used to indicate the movement of the materials from one bank of machines to another. Ultimately these department layouts are assembled to form the entire production unit housed in the manufacturing building. Until this point the building exists only as a grid of regularly spaced columns with no limiting walls around them . . . As the machine layout becomes more definitely established the template plans begin to take the outlines of actual buildings, and where the process requires several stories the plans are set up accor-

dingly. Only at this point does the work . . . move to the main drafting room, where working drawings are begun and orders are placed for hard-to-get items.

Engineering and design features were also shaped by safety and defense requirements. First-floor production areas were generally shielded by blank masonry walls so that workers would be protected from bomb splinters in the event of enemy attack. Surmounting these walls were large expanses of industrial steel sash and monitor skylights, designed to blow outward in case of accidental detonations on the production lines (Figures 3 & 4). And power plants were equipped with forced-draft intake systems, "making possible the elimination of the telltale stacks whose long shadows are so useful to hostile bombers in locating the target"<sup>9</sup> (Figure 5).

As initially designed, the TCAAP consisted of approximately 100 buildings, most of which served as storage, maintenance, and utility facilities. In terms of size and functional importance, the major buildings at the site were an administration building (Building 105), two 30-caliber ammunition shops (101, 102) a .50-caliber ammunition shop (Building 103), a lead shop (Building 111), a primer manufacturing building (Building 135), and a power house (Building 115). Constructed of brick, steel, and concrete, these buildings exhibited a clean-lined, industrial style that was typical of Smith, Hinchman & Grylls' work during the late 1930s and early 1940s. By the time the United States entered the war in December 1941, vitrually all of the principal buildings had been enclosed, and most were fully completed within the next few months.<sup>10</sup>

Immediately following the attack on Pearl Harbor, the TCAAP was designated a war plant, and its construction activities placed under the jurisdiction

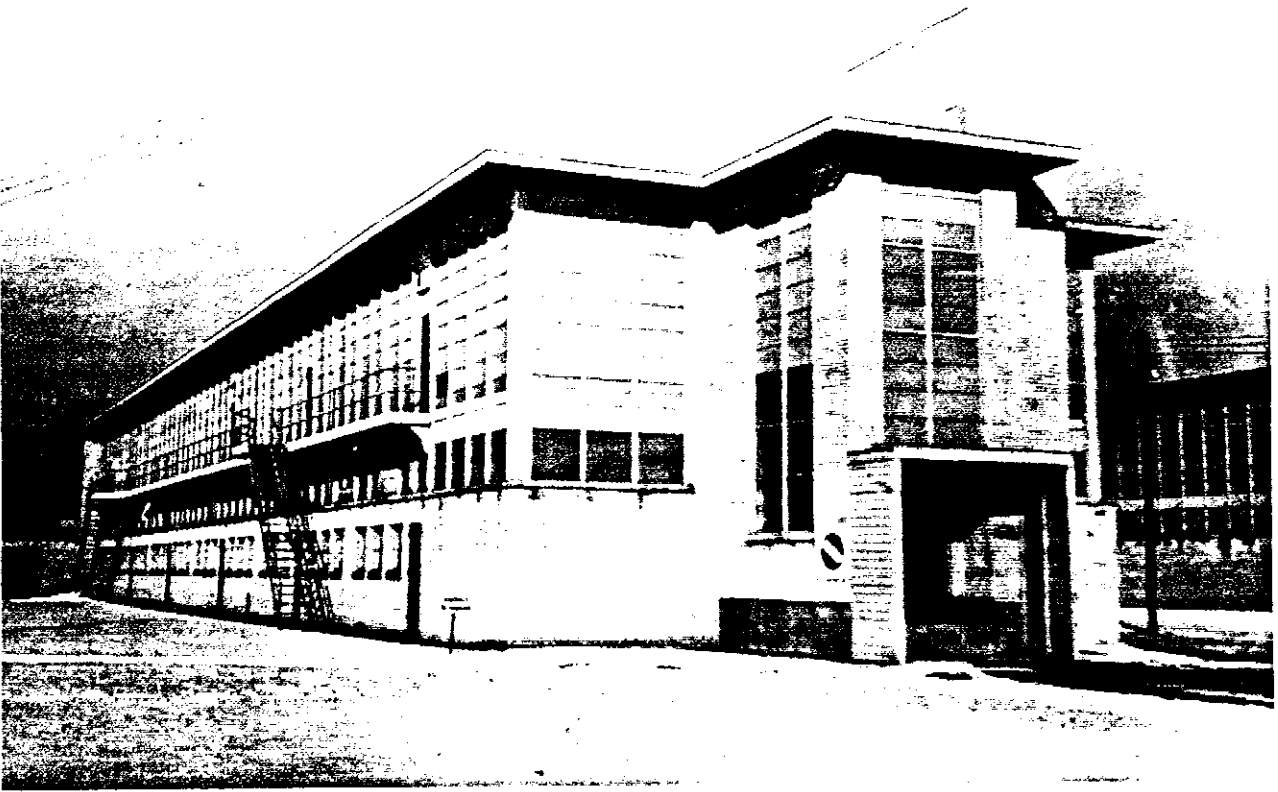


Figure 3: Photograph taken ca. 1943 showing Building 102, now 7.62-mm Cartridge Loading Facility. Note masonry lower portions designed to stop bomb splinters in case of attack. Also note glass upper portion designed to blow out in case of accident. (Source: John Woolfenden, "Small Arms Munitions.")



Figure 4: Photograph taken in 1983 showing Building 102,  
7.62-mm Cartridge Loading Facility. (Source:  
Field Inventory Photograph, Robert C. Mack,  
MacDonald and Mack Partnership.)

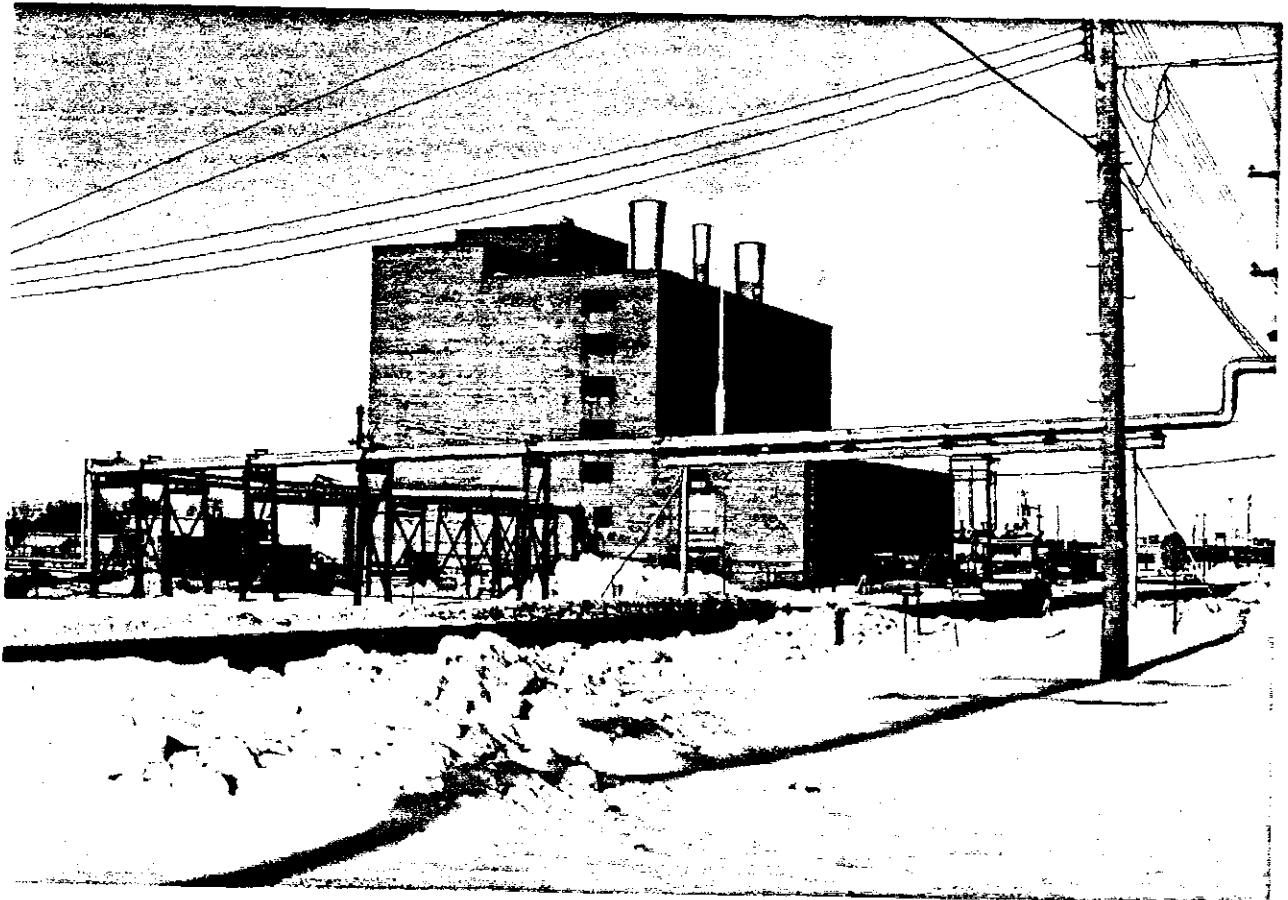


Figure 5: Photograph taken in 1983 showing Building 115, the Heating Plant. Note the short stacks designed to cast minimal shadows. (Source: Field Inventory Photograph, Robert C. Mack, MacDonald and Mack Partnership.)

of the Army Corps of Engineers. In early January 1942, the government authorized an expansion of the plant, which doubled its original number of buildings. Because of critical material shortages and accelerated construction schedules, Smith, Hinchman & Grylls designed almost all of the new buildings as "temporary" wooden structures, paying little attention to style or architectural detailing (Figure 6). This second phase of construction was virtually complete by the summer of 1942. Its principal structures included two .30-caliber ammunition shops (Buildings 501, 502), a .50-caliber ammunition shop (Building 503), a lead shop (Building 511), a primer manufacturing building Building (535), and a power plant (Building 515). The only other major construction project undertaken at the TCAAP during the war was the erection of an additional, wooden, .50-caliber ammunition shop (Building 576) which was authorized in June 1942, and apparently completed in early 1943.<sup>11</sup>

### Technology

The TCAAP began manufacturing small arms ammunition on February 2, 1942, and remained in production until September 28, 1945. Over this forty-four-month period, the plant turned out almost equal amounts of .30-caliber and .50-caliber cartridges, with total production slightly in excess of 4.3 billion rounds. This quantity accounted for roughly ten percent of all small arms ammunition manufactured in the United States during World War II.<sup>12</sup>

Like all of the first- and second-wave plants, the TCAAP based its production methods on standardized plans developed at Frankford Arsenal during



Figure 6: Photograph of Building 501, now 155-mm Metal Parts Building, taken in 1983. (Source: Field Inventory Photograph, Robert C. Mack, MacDonald and Mack Partnership.)

the late 1930s, and for the most part, these procedures remained in effect throughout the war. Production techniques for .30 and .50-caliber ammunition was basically the same, and this also held true for the different types within each caliber -- armor-piercing, ball, incendiary, and tracer. Each completed cartridge consisted of four major components: cartridge case, primer, bullet, and propellant. All of the first- and second-wave plants manufactured the first three of these components, and then assembled them with propellant to produce a finished round of ammunition.<sup>13</sup>

Most of the manufacturing processes took place in long, two-story structures known as ammunition shops. The first-floor of these buildings housed the bulk of the production machinery, while the second-floor primarily contained elevator-conveyor systems that serviced the production lines below by lifting away the partially finished products discharged by one bank of machines and then feeding them downward into the hoppers of the next bank. At the TCAAP, four shops were originally devoted to .30-caliber production (Buildings 101, 102, 501, 503) and three to .50-caliber production (Buildings 103, 503, 507).

The first step in manufacturing a completed round of ammunition was the formation of the cartridge case, which began with a small brass cup produced at other munitions plants. The cup was gradually elongated and shaped by a series of pressing, annealing, trimming, and stamping operations. This process has been described in the following way:

To wash off every trace of surface impurity [the cups] were rinsed in cold water, bathed in hot soapy water, rinsed again, and dried. Only then were they ready for the "first draw" during which a long, powerful punch was forced into each cup, making it

deeper and thinner-walled -- more like a drinking glass than a cup. Four such draws were needed before the case reached its proper length, and after each draw, the cases [were] annealed, pickled [to remove the oxide film that formed during annealing], washed, dried, and trimmed. Company inspectors visually examined the cups after each operation to detect crooked heads, scratches, or other defects; they also gaged them for length, inside and outside diameter, and wall thickness. Next came the punching of a small pocket in the head of the case to hold the primer cup, followed by the heading operation that flattened the end of the case, stamped on it the plant initials and year of manufacture, and cut the extractor groove. The tapering and necking process was far more difficult than it appeared to be. It demanded careful annealing and precision working of the case to give it a narrow neck, sloping shoulders, and a slightly tapered body. Only the body was annealed -- not the head, for it had to remain hard -- so cases were slipped into holes in a revolving dial that exposed the bodies to a row of gas burners while the heads were submerged in cold water. The next step was insertion of the primer.<sup>14</sup>

Primer manufacturing at the TCAAP took place in two concrete-reinforced buildings (Buildings 135, 535), which were located in insulated areas as a protection against potential detonations. In these structures, machines designed for stamping, pressing, and loading operations cut and shaped sheets of copper-and-zinc alloy into small, thin-walled cups, filled them with an explosive charge, and then capped them with a delicate, metallic plate, or "anvil" (Fig. 7). The completed primers were then trucked to "primer-insert wings" at the main ammunition shops, where punching, seating, and crimping machines fitted them into the base ends of completed cartridge cases. The cartridge cases were then ready to be delivered to the shops' "loading wings," there they were filled with propellant and topped with bullets.

Bullets consisted of two major parts: lead core and gilding metal jacket. At the TCAAP's lead shops (Buildings 111, 511), powerful extruding presses turned lead blocks into slender strands of wire, which were then cut and

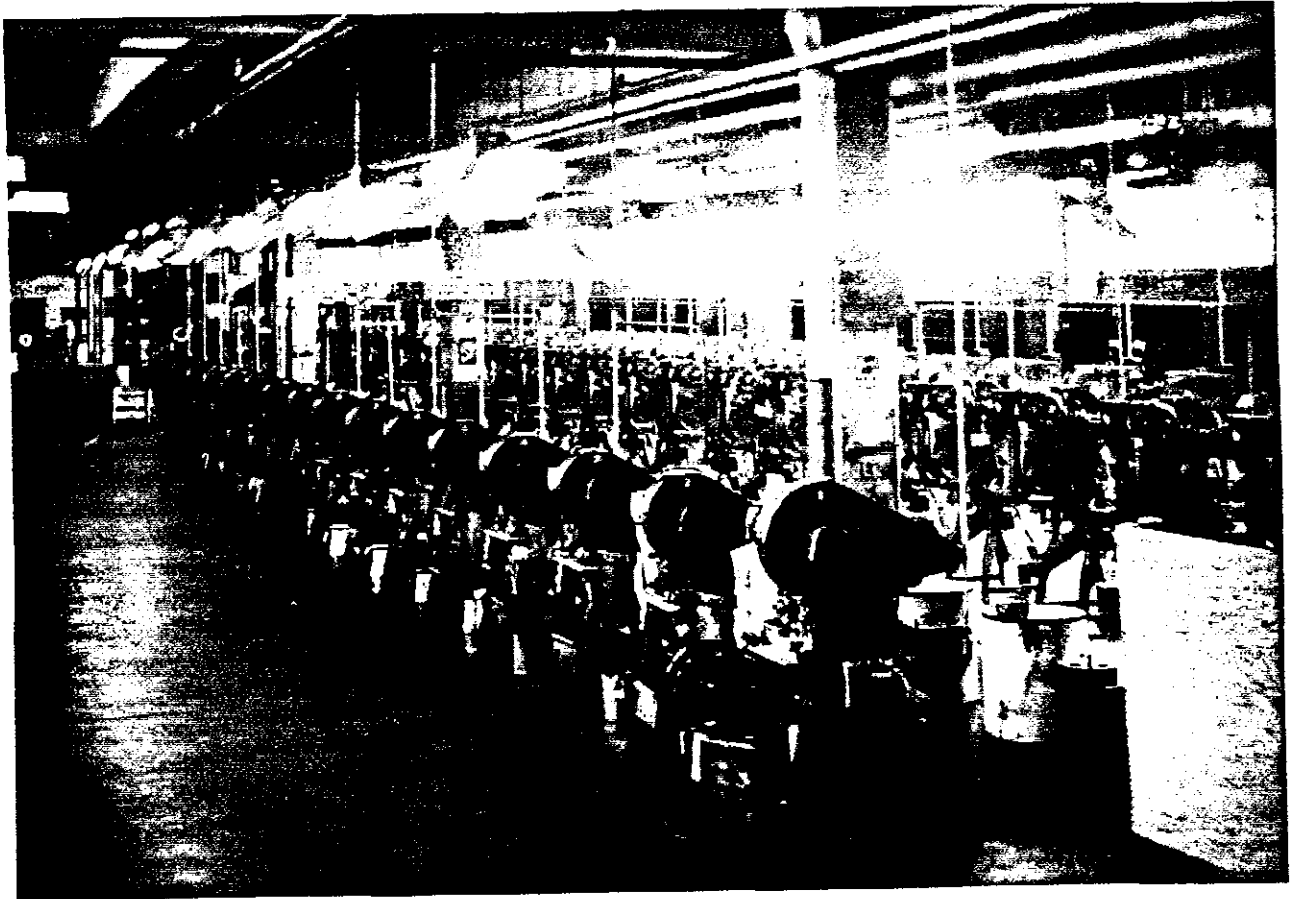


Figure 7: Photograph of Primer Cup and Anvil machines  
in Primer Manufacturing Building, ca. 1942.  
(Source: Photo album in Federal Cartridge  
Corporation Archives, Twin Cities AAP.)

shaped into cores on swaging machines. Jacket production was a far more complicated process, and it took place in the main manufacturing areas of the ammunition shops. In its general outlines, the process was similar to cartridge-case manufacturing: "Starting with strips of gilding metal, disks were stamped out and formed into cups which then went through a whole series of annealing, pickling, cleaning and drawing operations, before they were ready to be slipped over lead [cores by means of bullet-assembly machines]." <sup>15</sup> The completed bullets were shipped to the plant's loading wings for final assembly with powder propellant and primed cartridge cases. At the TCAAP, this operation was usually performed on a "straight-line" loading machine:

[Cartridge] cases are fed from a hopper to a dial under a powder-filled hopper. At the first station, a metered charge of powder is admitted to the cartridge cases, which is then moved to the next station, where a bullet, which has been fed from another hopper, is inserted. The bullets and cases are then carried to another station, where the bullets are forced into the cases. At the next station, a crimping tool comes down and closes the mouth of the cartridge around the mouth of the bullet. The finished cartridge is then turned over, dipped into . . . lacquer, and fed into a drying dial, from which it is later ejected from the machine. <sup>16</sup>

Before the completed ammunition was packaged for shipment, it passed through a gaging machine that checked each cartridge for proper size and weight.

In 1944, Buildings 501 and 502 at the TCAAP were withdrawn from .30-caliber production and converted, respectively, to 155-mm and 105-mm shell-casing manufacturing. National Can Company served as operating contractor for the 155-mm lines; International Harvester Company for the 105-mm. <sup>17</sup> As part of this conversion process, building 502 was outfitted with a forging plant

and "a hodge-podge of machines, new and old, to get shells rolling right away."<sup>18</sup> Since neither the original plans nor machinery survive, little else is known about the 105-mm operation. Most of the original 155-mm lines, however, still remain in Building 501, and their configuration reflects standard, World-War-II production technology.<sup>19</sup>

Unlike small arms ammunition, which was manufactured as self-contained cartridges, 155-mm ammunition was literally put together on the battlefield. Primer, propellant, and shell were each loaded separately into the breach of the cannon, "since one of these shells with an attached cartridge case loaded with the propelling charge would be too heavy to handle on the firing line."<sup>20</sup> The shell was essentially a hollow steel casing filled with explosives and tipped with a detonating fuse. Each of these shell parts was manufactured by separate munitions works, and final assembly was the responsibility of specialized loading plants. Basic production methods for 155-mm shell casings had been developed at Frankford Arsenal during the late 1930s, but effective, mass-production techniques did not appear until private contractors grappled with the problem on their own production lines in the early 1940s. Willys-Overland Motors Company played a leading role in this technological development, and their plant in Toledo, Ohio became "the clearing house for information of the best method of manufacturing 155-mm shell [casings]."<sup>21</sup> It is therefore not surprising that the TCAAP's 155-mm lines closely resemble those used at the Willys plant.

At the TCAAP, the 155-mm process began with forged, steel cylinders that had already been pierced to form their interior cavity. After these cylinders were unloaded at the plant, they were subjected to a series of

latheing, pressing, heat-treating, and cleaning operations designed to produce the projectiles' proper shape, dimensions, and hardness. Following these "rough-turn" and "finish-turn" procedures, a knurled groove was cut into the lower end of each casing, and a copper band pressed into place. During the pressing process, the knurlings in the grove imprinted the band with the ridges, which were designed to engage the run rifling when the projectile was fired. Next, a steel disc was welded onto the base end of the casing to seal off any invisible cracks that might cause the shell's premature detonation in the gun barrel. With this step completed, the casing required only painting and final inspection before being delivered to loading plants.

At the end of World War II, the TCAAP was one of the two government-owned, contractor-operated, small arms plants to be retained as standby facilities.<sup>22</sup> Although the production lines were immediately shut down and laid away in preservative grease, the plant continued to perform certain military activities. In 1944, the Ordnance Department had opened a "reclamation center" in building 513 for salvaging metal scrap from unuseable small arms ammunition. This operation remained in government hands until the spring of 1951, when it was taken over, on a contract basis, by Federal Cartridge Company as part of the plant's reactivation for the Korean War. During the 1944-1951 period, approximately 550 million rounds of ammunition were processed, and significant contributions were made to salvage technology.<sup>23</sup>

When the reclamation center first opened in 1944, workers salvaged ammunition one round at a time on air-actuated, hand-fed, "bullet-pull" machines, which serviced about 1,500 pieces per hour. Machine inventory records at

the TCAAP describe the process as follows: "the cartridge is manually fed in a vertical position. Machine is activated by a foot lever and removes the bullet from case. The bullet then is dropped into discharge chute, powder is manually removed, and case then manually discharged."<sup>24</sup> In the late 1940's, two employees at the reclamation center -- Lyle D. Morrison and Robert D. Campbell -- speeded salvage operations by inventing an electric-powered, cartridge-disassembly machine, which automatically segregated cartridge cases, bullets, and powder (Figure 8). The key to the new invention was a vertically positioned, revolving wheel with slotted pockets in its circumference. a conveyor system fed a cartridge into each pocket, and the wheel then carried the cartridge through a series of rotating steel rollers, which extracted the bullet. As the wheel revolved downward, the powder fell into one collection chute and the cartridge case into another. The .30-caliber disassembly machine contained 120 pockets and processed about 16,00 rounds per hour; the .50-caliber machine had 60 pockets and an hourly output of about 10,700 pieces. The first machines were built at the TCAAP plant, and their design proved so successful that it became "the standard to the industry, both in this country and overseas."<sup>25</sup>

#### KOREAN WAR

In August 1950, production facilities at the TCAAP were reactivated for the Korean War. The plant remained in operation until December 1957, when it reverted to standby status.<sup>26</sup>

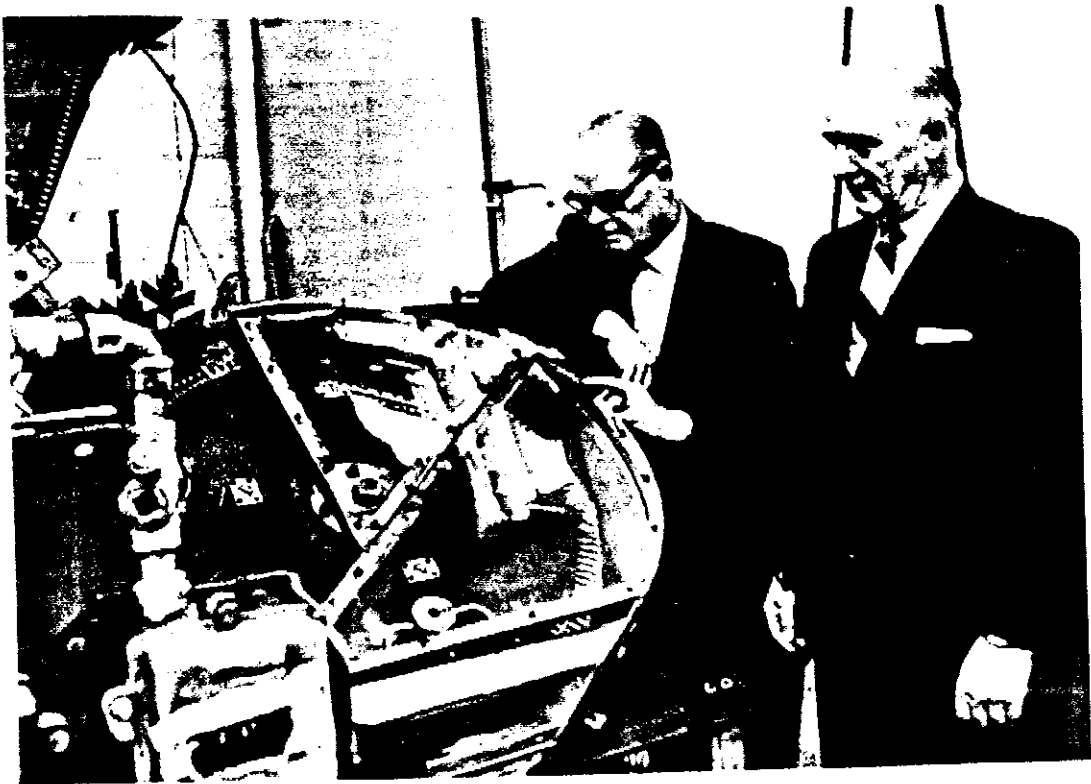


Figure 8: Photograph of "Bullet Pull Machine" taken  
ca. 1970. (Source: Twin Cities Fire Power  
News, 3 October 1970, p. 3.)

### Construction

During the early 1950s, repair work was completed on at least 248 buildings at the TCAAP site. Major new construction involved the erection of a masonry warehouse (Building 190), a coal-loading facility (Building 104), a blank-cartridge assembling building (Building 189), wing additions to two ammunition shops (Buildings 101, 102), and a forge shop in the 155-mm shell parts plant (Building 501).<sup>27</sup>

### Technology

Between August 1950 and December 1957, the TCAAP produced approximately 3.5 billion rounds of small arms ammunition; 3.2 million 105-mm, metal, shell parts; and 715 thousand 155-mm, metal, shell parts. On a contract basis, Federal Cartridge Company operated the small arms ammunition and cartridge disassembly lines; Minneapolis-Moline Company the 105-mm lines; and Donovan Company the 155-mm lines. The following principal buildings were reactivated: 105 (administration), 101 (.30-caliber), 102 (.30-caliber), 103 (.50-caliber), 503 (.45-caliber), 111 (bullet cores), 135 (primers), 501 (155-mm shell casings), 502 (105-mm shell casings), 589 (cartridge disassembly). Except for 155-mm shell casings, there seem to have been very few technological departures from the plant's World-War-II operations.<sup>28</sup>

Since neither the original plans nor machinery from the .45 caliber lines survive, little is known about this activity. The 155-mm forging machinery, however, still remains in building 501, and its setup closely follows standard World-War-II practices.<sup>29</sup> At the TCAAP 155-mm forge

plant, steel billets were cut to specified length on a "breaker," and then heated in a gas-fired, rotary furnace. When each billet emerged from the furnace, it was placed in a descaling machine then then transferred to a powerful piercing press, which formed the interior cavity of the shell casing. In the next forging operation, the still-hot billet was positioned in draw bench, which forced the rectangular block through a series of die rings to produce a cylindrical shape. The forging was then ready for the "rough-turn" and "finish-turn" procedures, which have been described above in the section dealing with World-War-II technology.

#### VIETNAM WAR

In December 1965, the TCAAP was reactivated for the Vietnam War. Parts of the plant remained in production until the spring of 1976, when the entire facility reverted to standby status.<sup>30</sup>

#### Construction

Between 1965 and 1976, approximately 20 new structures were erected at the TCAAP. Almost all of these buildings are small storage, utility, and maintenance facilities that conform to the general design patterns of the installation. The one substantial structure dating from this period is an indoor firing range (Building 308), which was completed in 1968. The range was built largely in response to complaints from nearby residents, who objected to the noise level of the original outdoor facility.<sup>31</sup>

### Technology

During the Vietnam War two of the plant's Korean-War contractors resumed their former duties; Federal Cartridge Company again supervised the small arms ammunition lines and cartridge-disassembly operation, and Donovan Company the 155-mm shell-casing lines.<sup>32</sup> The 105-mm shell-casing lines were not reactivated, and the production equipment was removed from the plant. Although the 155-mm operation remained virtually intact, the small arms ammunition lines experienced a number of changes. Most of the former .45-caliber and .50-caliber machinery was disassembled and removed, and Federal Cartridge Company was instructed to modify the existing .30-caliber lines for the manufacture of modern 5.56-mm and 7.62-mm ammunition. This entailed the retooling of most cartridge-case, bullet-jacket, bullet-core, bullet-assembly, primer, cartridge-loading, and cartridge-inspection machinery. At the same time, production methods were streamlined by combining heading and pocketing operations for cartridge cases, reducing the number of cartridge-case draws from four to three, consolidating inspection procedures, and introducing certain pieces of modern machinery, such as a new extruder in the lead shop. Despite these renovations, the basic technology for small arms ammunition remained the same, and much of the original production machinery continued to be used.<sup>33</sup>

In the late 1960's, Federal Cartridge Company was awarded an additional contract to assist in the development of a highly automated Small Caliber Ammunition Modernization Program (SCAMP), which was intended to revolutionize manufacturing procedures. The program was premised on the idea that it was more efficient and cost effective to adopt a new approach to

small arms ammunition production than to "attempt to replace existing equipment on a piece-meal basis, and still end up with an antiquated production system at a price much higher than the original cost of the equipment." On the basis of production plans developed at Frankford Arsenal, Federal Cartridge Company supervised the installation of prototype machinery for 5.56 ammunition, and in 1974, the company successfully completed a 10-million-piece production run. After an additional 45-million-piece run in 1975, the SCAMP machinery was laid away, and eventually transferred to the Lake City Army Ammunition Plant in the Lake City, Missouri.<sup>34</sup>

During the period 1965-1976, the following principal buildings at the TCAAP were reactivated: 105 (administration), 101 (7.62-mm), 111 (lead shop), 135 (primer), 501 (155-mm shell casings), 503 (5.56-mm), 589 (cartridge-disassembly), 189 (SCAMP). Production figures totaled approximately 1.8 billion rounds of 7.62 ammunition; 5.9 billion rounds of conventionally produced 5.56-mm ammunition; 55 million rounds of SCAMP-produced 5.56 ammunition; and 4.2 million, 155-mm shell casings.<sup>35</sup>

#### NOTES

1. Harry C. Thomson and Lida Mayo, The Ordnance Department: Procurement and Supply (Wash., D.C.: Office of the Chief of Military History, Department of the Army, 1960), pp. 191-192; see also Small Arms Ammunition, A History of an Industry, vol. 1 (No. pl.: Ammunition Branch, Small Arms Division, Office of Chief of Ordnance, c. 1945), pp. 69-71.
2. Thomson and Mayo, pp. 194-196. The importance of the initial production planning at Frankford Arsenal is underscored in Charles O. Herb, "Small Arms Ammunition," Machinery, 49 (Apr. 1943), 136. Authorized in the fall of 1940, the first-wave plants were established at Lake City, Missouri; St. Louis; and Denver. The second-wave plants were authorized in the spring of 1941, and in addition to the Twin

Cities location, they were constructed at Des Moines, Iowa and Salt Lake City. The Ordnance Department eventually established twelve government-owned, contractor-operated plants for the manufacture of small arms ammunition during World War II. Most of the later plants, however, were set up in existing factory facilities with only limited new construction; see Thomson and Mayo, pp. 200-203; Small Arms Ammunition, vol. 2, pp. 167-177.

3. Small Arms Ammunition, vol. 1, pp. 107, 143.
4. The conformance of the TCAAP site with selection criteria is discussed in Reference #45, "Proposed Small Arms Ammunition Plant at St. Paul, Minnesota," Ordnance Department memo, May 27, 1941 in Small Arms Ammunition, vol. 2, pp. 149-152. On the importance of railroad proximity and the availability of gas, see "War Plants Need Much Trackage," Railway Age, 114 (Jan. 2, 1943), 40-42; "Use of Gas in the Production of Munitions," Gas Age, 87 (Mar. 27, 1941), 21-23; "Gas--A major Tool in War Production," Gas Age, 90 (July 16, 1942), 38-42. On the selection of Federal Cartridge Company as TCAAP contractor, see Reference #41, "Reasons for the Selection of the Contractors," Ordnance Department memo, Oct. 1, 1941, in Small Arms Ammunition, vol. 2, p. 141.
5. Former land use at the TCAAP site is discussed in Raymond H. Merritt, Creativity, Conflict & Controversy: A History of the St. Paul District U.S. Army Corps of Engineers (Wash., D.C.: U.S. Government Printing Office, n.d.), p. 402; "125 Buildings Will Be Sold at Arms Site," Minneapolis Times, Oct. 9, 1941; "Historical Report of the Twin Cities Ordnance Plant, July 14, 1941 to December 31, 1942," pp. 1-2, unpublished report prepared by Federal Cartridge Company, 1943, in Federal Cartridge Company Archives, TCAAP.
6. "Historical Report," pp. 2-4.
7. Smith, Hinchman & Grylls, Inc., "Small Arms Ammunition Plants," Architectural Forum, 77 (Dec. 1942), 61-69, 70; John J. Woolfenden, "Small Arms Munitions," Heating and Ventilation, 40 (June 1943), 47; Thomas J. Holleran and James P. Gallagher, Smith, Hinchman & Grylls (Detroit: Wayne State University Press for Smith, Hinchman & Grylls Associates, Inc., 1978), pp. 143, 145. According to company records, Smith, Hinchman & Grylls designed all of the first- and second-wave plants, except the one at St. Louis; authors' interview with Jim Braathen, Building Manager, Smith, Hinchman & Grylls, Aug. 24, 1983.
8. Smith, Hinchman & Grylls, 65.
9. Smith, Hinchman & Grylls, 75-76, 88.
10. William Voight, Jr., "GOCO Facilities Directory," in "The Ordnance Organization in World War II," p. 299, unpublished report on microfiche, 1945, in ARRCOM Historical Office Archives: U.S. Army Corps of Engineers, Omaha District, "Industrial Facilities Inventory for the Twin Cities Ordnance Plant," pp. 8a-9. Mar. 1, 1944, in ARRCOM Historical Office Archives; "Historical Report," p. 5.

11. "Historical Report," pp. 5-6 and memo in appendix, dated July 1, 1942, n.p.; "Industrial Facilities Report," pp. 8a-9, 400. Smith, Hinchman & Grylls acknowledges its role in designing the temporary structures at the TCAAP in John J. Woolfenden, "The Twin Cities Ordnance Plant," Heating and Ventilation, 40 (June 1943), 52. Apparently, the company was also responsible for designing temporary structures at other first- and second-wave plants. A spokesman for the firm given the following description: "Construction of the temporary wood plants is very simple: lapped siding on wood frame with stock wood sash. No consideration has been given to appearance, and even exterior paint has been omitted" (Smith, Hinchman & Grylls, 82).
12. "Historical Report of the Twin Cities Ordnance Plant, October 1, 1945 to December 31, 1945," p. 55, unpublished report prepared by Federal Cartridge Company, 1946, in Federal Cartridge Company Archives, TCAAP; Thomson and Mayo, p. 188.
13. The discussion of production methods for small arms ammunition relies heavily on the following sources: Thomson and Mayo, pp. 204-207; Charles O. Herb, "Small Arms Ammunition from One of Remington's New Plants," Machinery, 49 (Apr., June, 1943), 136-151, 142-151. These sources provided detailed technological descriptions that were authenticated for the TCAAP by checking the plant's machinery layout plans included in "Industrial Facilities Report," pp. 418-485. Subsequent citations will be restricted to direct quotations.
14. Thomson and Mayo, p. 205.
15. Thomson and Mayo, p. 206.
16. Herb, (June, 1943), 147.
17. Basic Unit History, TCAAP, 1941-1967," p.1, unpublished report on microfiche, n.d., in ARRCOM Historical Office Archives; St. Paul Pioneer-Press, Sept. 7, 1944.
18. Minneapolis Star-Journal, Nov. 23, 1944.
19. This evaluation of the 155-mm technology is based on a tour of the facility conducted by Courtland Torgeson of Donovan Company on Jan. 6, 1983, and detailed production information on the Willys-Overland Motor Company's shell-casing plant provided by Joseph Frazer, "Millions of 155-Millimeter Shells," Ordnance Production Methods, ed. Charles O. Herb (New York: Industrial Press, 1951), pp. 83-97.
20. Frazer, pp. 83-84.
21. Frazer, p. 83.
22. Thomson and Mayo, p. 221. The other standby facility was Lake City Army Ammunition Plant near Independence, Missouri.

23. "Basic Unit History, TCAAP," pp. 1-2. Proposed machinery layouts for the reclamation center in building 513 are found in "Industrial Facilities Inventory," p. 480.
24. Property No. 156990, Machinery Historical Record Files, building 105, TCAAP; see also Twin Cities Fire Power News Oct. 1970, in Federal Cartridge Company Archives, TCAAP.
25. The cartridge disassembly machines and their inventors are briefly discussed in Twin Cities Fire Power News, Oct. 1970. Two prototype machines are currently located in building 589. The .30-caliber model was built in 1948; the .50-caliber in 1949. See Property No. 107266 and No. 107271, Machinery Historical Record Files.
26. "TCAAP Information Brochure," p. 5, unpublished, n.d., in ARRCOM Historical Office Archives.
27. See Minneapolis Star, May 5, Sept. 27, 1952; St. Paul Pioneer-Press, June 6, 1952; TCAAP Real Property Inventory Print-Out, Mar. 31, 1982, unpublished, in Real Property Office Files, TCAAP Site Map, 1974, unpublished, Drawing No. 132, in Real Property Office Files, TCAAP.
28. Production and contractor information is found in "TCAAP Information Brochure," pp. 5-6; "Basic Unit History, TCAAP," pp. 2-3. Reactivated facilities are briefly described in the following reports and memos on file at the Federal Cartridge Company Archives, TCAAP: "Proposed Outline of .30-Caliber Reactivation," 1950; "Reactivation of Twin Cities Arsenal," Jan. 1951; "Chronological Outline of Significant Events Pertaining to 5.56 mm Ball Reactivation, Conversion and Production," 1966.
29. This technological evaluation of the TCAAP's 155-mm forge plan is based on a tour of the facility conducted by Courtland Torgeson on Jan. 6, 1983. Information on comparable World-War-II production methods is found on Frazer, 84-88.
30. "TCAAP Information Brochure," pp. 5-6.
31. New construction data was compiled from a general architectural field survey of the installation guided by TCAAP Real Property Inventory Print-Out, 1982; TCAAP Site Map, 1974. On the construction of the indoor firing range, see "Basic Unit History, TCAAP," pp. 7-8 Twin Cities Fire Power News, Jan. 1970.
32. "TCAAP Information Brochure," pp. 5-6.
33. This evaluation of the TCAAP's 5.56-mm and 7.62-mm lines is based on a tour of the facilities conducted by Ken Buckley of Federal Cartridge Company on Jan. 11, 1983. Pertinent information was also found in "Chronological Outline of Significant Events Pertaining to 5.56 mm Ball Reactivation, Conversion and Production Program."

34. For an overview of the SCAMP operation, see "TCAAP Information Brochure," p. 5; "Small Caliber Ammunition Modernization Program," unpublished report, n.d., in ARRCOM Historical Office.

### Chapter 3

## PRESERVATION RECOMMENDATIONS

### BACKGROUND

Army Regulation 420-40 requires that an historic preservation plan be developed as an integral part of each installation's planning and long-range maintenance and development scheduling.<sup>1</sup> The purpose of such a program is to:

- . Preserve historic properties to reflect the Army's role in history and its continuing concern for the protection of the nation's heritage.
- . Implement historic preservation projects as an integral part of the installation's maintenance and construction programs.
- . Find adaptive uses for historic properties in order to maintain them as actively used facilities on the installation.
- . Eliminate damage or destruction due to improper maintenance, repair, or use that may alter or destroy the significant elements of any property.
- . Enhance the most historically significant areas of the installation through appropriate landscaping and conservation.

To meet these overall preservation objectives, the general preservation recommendations set forth below have been developed:

#### Category I Historic Properties

All Category I historic properties not currently listed on or nominated to the National Register of Historic Places are assumed to be eligible for

nomination regardless of age. The following general preservation recommendations apply to these properties:

- a) Each Category I historic property should be treated as if it were on the National Register, whether listed or not. Properties not currently listed should be nominated. Category I historic properties should not be altered or demolished. All work on such properties shall be performed in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation (ACHP) as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800).
- b) An individual preservation plan should be developed and put into effect for each Category I historic property. This plan should delineate the appropriate restoration or preservation program to be carried out for the property. It should include a maintenance and repair schedule and estimated initial and annual costs. The preservation plan should be approved by the State Historic Preservation Officer and the Advisory Council in accordance with the above-referenced ACHP regulation. Until the historic preservation plan is put into effect, Category I historic properties should be maintained in accordance with the recommended approaches of the Secretary of Interior's Standards for Rehabilitation and

Revised Guidelines for Rehabilitating Historic Buildings<sup>2</sup> and  
in consultation with the State Historic Preservation Officer.

- c) Each Category I historic property should be documented in accordance with Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Documentation Level II, and the documentation submitted for inclusion in the HABS/HAER collections in the Library of Congress.<sup>3</sup> When no adequate architectural drawings exist for a Category I historic property, it should be documented in accordance with Documentation Level I of these standards. In cases where standard measured drawings are unable to record significant features of a property or technological process, interpretive drawings also should be prepared.

#### Category II Historic Properties

All Category II historic properties not currently listed on or nominated to the National Register of Historic Places are assumed to be eligible for nomination regardless of age. The following general preservation recommendations apply to these properties:

- a) Each Category II historic property should be treated as if it were on the National Register, whether listed or not. Properties not currently listed should be nominated. Category II historic properties should not be altered or demolished. All work on such properties shall be performed

in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation (ACHP) as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800).

- b) An individual preservation plan should be developed and put into effect for each Category II historic property. This plan should delineate the appropriate preservation or rehabilitation program to be carried out for the property or for those parts of the property which contribute to its historical, architectural, or technological importance. It should include a maintenance and repair schedule and estimated initial and annual costs. The preservation plan should be approved by the State Historic Preservation Officer and the Advisory Council in accordance with the above-referenced ACHP regulations. Until the historic preservation plan is put into effect, Category II historic properties should be maintained in accordance with the recommended approaches in the Secretary of the Interior's Standards for Rehabilitation and Revised Guidelines for Rehabilitating Historic Buildings<sup>4</sup> and in consultation with the State Historic Preservation Officer.
- c) Each Category II historic property should be documented in accordance with Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) Documentation Level

II, and the documentation submitted for inclusion in the HABS/HAER collections in the Library of Congress.<sup>5</sup>

### Category III Historic Properties

The following preservation recommendations apply to Category III historic properties:

- a) Category III historic properties listed on or eligible for nomination to the National Register as part of a district or thematic group should be treated in accordance with Sections 106 and 110(f) of the National Historic Preservation Act as amended in 1980, and the regulations of the Advisory Council for Historic Preservation as outlined in the "Protection of Historic and Cultural Properties" (36 CFR 800). Such properties should not be demolished and their facades, or those parts of the property that contribute to the historical landscape, should be protected from major modifications. Preservation plans should be developed for groupings of Category III historic properties within a district or thematic group. The scope of these plans should be limited to those parts of each property that contribute to the district or group's importance. Until such plans are put into effect, these properties should be maintained in accordance with the recommended approaches in the Secretary of the Interior's Standards for Rehabilitation and Revised

Guidelines for Rehabilitating Historic Buildings<sup>6</sup> and in consultation with the State Historic Preservation Officer.

- b) Category III historic properties not listed on or eligible for nomination to the National Register as part of a district or thematic group should receive routine maintenance. Such properties should not be demolished, and their facades, or those parts of the property that contribute to the historical landscape, should be protected from modification. If the properties are unoccupied, they should, as a minimum, be maintained in stable condition and prevented from deteriorating.

HABS/HAER Documentation Level IV has been completed for all Category III historic properties, and no additional documentation is required as long as they are not endangered. Category III historic properties that are endangered for operational or other reasons should be documented in accordance with HABS/HAER Documentation Level III, and submitted for inclusion in the HABS/HAER collections in the Library of Congress.<sup>7</sup> Similar structures need only be documented once.

#### CATEGORY I HISTORIC PROPERTIES

There are no Category I historic properties at the Twin Cities AAP.

## CATEGORY II HISTORIC PROPERTIES

There are no Category II historic properties at the Twin Cities AAP.

## CATEGORY III HISTORIC PROPERTIES

7.62-mm Production Facilities (Buildings 101 & 102)

Post Headquarters (Building 105)

Lead Shop (Building 111)

Heating Plant (Building 115)

Primer Manufacturing Facility (Building 135)

Major Caliber Production Facility (Building 501)

5.56-mm Production Facility (Building 503)

- . Background and Significance: These buildings, constructed in 1942, were part of the first and second "waves" of building at the Twin Cities AAP. They embody many of the specialized design features developed by Smith, Hinchman, & Grylls for small arms ammunition plants. The manufacturing buildings contain much World War II-era production equipment that has been retooled for modern ammunition sizes. (See Chapter 2 sections on World War II construction and technology, and illustrations 3 through 8 for a more complete discussion of the buildings and equipment.) None of the properties meet the eligibility criteria for the National Register of Historic Places for buildings less than fifty years old, but they should be reevaluated at a later date. As good examples of a highly intact

architectural and manufacturing ensemble, these buildings and their equipment are Category III properties.

- . Condition and Potential Adverse Impacts: The manufacturing buildings and their production equipment are "laid away." The Post Headquarters and the Heating Plant are regularly used, but on a limited basis. All buildings and equipment receive routine maintenance and are in good condition. Building 102 is being considered for "outgranting," or leasing to an outside contractor; it may be subject to modification by that contractor. There are no other planned alterations which would have a significant impact on these facilities.
- . Preservation Options. See general preservation recommendations at the beginning of this chapter for Category III properties. If building 102 is leased to an outside contractor, the lease should include requirements for the contractor to follow the same guidelines.

#### Cartridge Disassembly Machines

- . Background and Significance: The cartridge disassembly machines were developed in the late 1940s to speed the disassembly and salvage of unuseable .30- and .50-caliber ammunition. They could automatically salvage all portions of the bullet except the primer, and represented a major advance in the field of ammunition salvage. The machines became prototypes for the construction of similar equipment at other installations and for this reason are Category III properties. (See Chapter 2 section on post-World War II technology and Figure 8.)

- . Condition and Potential Adverse Impacts: The machines currently are "laid away" in good condition and receive routine maintenance. There currently are no plans for further modification or other actions which would have an adverse impact on them.
- . Preservation Options: The cartridge disassembly machines should be preserved and maintained to perform their original functions. If alterations are required for new ammunition sizes, the original pieces should be retained for possible reinstallation. At such time as the machines become obsolete, they should be thoroughly documented through photographs, motion pictures, and drawings. This documentation should be deposited with HAER for transmittal to the Library of Congress. Serious consideration should be given to preserving the machines themselves in an appropriate museum of military or technological history.

#### NOTES

1. Army Regulation 420-40, Historic Preservation (Headquarters, U.S. Army: Washington, D.C., 15 April 1984).
2. National Park Service, Secretary of Interior's Standards for Rehabilitation and Revised Guidelines for Rehabilitating Historic Buildings, 1983 (Washington, D.C.: Preservation Assistance Division, National Park Service, 1983).
3. National Park Service, "Archeology and Historic Preservation; Secretary of the Interior's Standards and Guidelines," Federal Register, Part IV, 28 September 1983, pp. 44730-44734.
4. National Park Service, Secretary of the Interior's Standards.
5. National Park Service, "Archeology and Historic Preservation."
6. National Park Service, Secretary of the Interior's Standards.
7. National Park Service, "Archeology and Historic Preservation."

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Minneapolis Star. May 5, 1952. Article discusses remodeling of the Twin Cities Ammunition Plant during Korean War reactivation.

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